



Fig. 2.—Detail of entrance doors of Acute Unit of Los Angeles County Hospital (facing State Street).

fortunate groups cannot be a part of the picture in our own land.

The ideal care of this institution demands public assistance in social service and in the building of a public conscience that the poor be not crowded out of this house of service by the modern economic chiseler. Let him who enters undeservedly know that he is in every sense a cheater, and truly unpatriotic—for patriotism, like charity, begins at home.

The dedication of this building should bring to the attention of our community the unselfishly contributed work of some three or four hundred physicians, chosen with searching care from the best of our profession. It is their work that makes this institution possible. It is their work that makes entrance here sought. Their annual contribution in service far overbalances that of the taxpayers. Let the public, then, here today remember to place on the dedication altar of this monumental structure—alongside their gifts of steel and stone—that still more precious gift, the patriotic service of her citizen physicians and surgeons, by whose labor this structure shall endure.

1930 Wilshire Boulevard.

SELVATIC PLAGUE—ITS PRESENT STATUS IN CALIFORNIA*

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IT is recognized quite universally that plague persists as a widespread epidemic among rats and other wild rodents. The most recent rat-borne plague has spread as a pandemic from a focus which developed in Hong Kong in 1894. Traveling along the trade routes of man it reached many ports and countries, where the rats were permitted to share with man his houses and his food supplies. Thus, in the countries with primitive civilization an intimate interplay of rodents and man favored the catastrophic outbreaks of plague which already claimed millions of victims. Experience

has taught that invariably an epidemic of rat plague precedes the appearance of the disease in man. Such a state of affairs was responsible for the epidemic of bubonic plague in San Francisco in 1900 and in 1907.

SELVATIC PLAGUE—MEANING OF THE TERM

On the other hand, the widespread liability of wild rodents to the plague bacillus has created large reservoirs of this pasteurellosis, which have existed for centuries in Asia or are in process of being created in other continents. This type of plague infection spreads slowly and insidiously from colony to colony of rodents, and is apparently independent of the usual lines of communication. It localizes principally in countries of a steppe or veldt-like character. The title *selvatic plague* (Jorge, Offic. internat. d'Hyg. Publ., 1928, 310, 435), is, therefore, quite appropriate. This source gives rise to sporadic cases among those who as hunters, trappers, and agriculturists or others are engaged in some branch of open-air life. The cases of bubonic plague which occurred in California between 1910 and 1924 (fifty-five cases with thirty-two deaths) belong to this type.

SELVATIC AND RAT-BORNE PLAGUE

There is a definite relationship between selvatic and rat-borne plague. Two formidable centers of rodent plague have existed for centuries in Transbaikalia and in Mongolia. From the latter developed the Manchurian pneumonic epidemic of 1910, which caused the death of 60,000 persons without a single recovery. From the steppes of south-eastern Russia and eastern Turkestan emanated the seeds for the black death of 1347 to 1349. Selvatic plague gives rise to pneumonic plague, provided overcrowding and climatic conditions of a low temperature and high humidity are favorable. That a secondary pneumonia which follows an exposure to a diseased squirrel may change to a primary pneumonia, is illustrated by an outbreak of pneumonic plague in Oakland, September, 1919 (fourteen cases and thirteen deaths). In fact, it is clearly demonstrated that once primary pneumonic plague has begun, other cases follow with great rapidity. An example of this sort presented itself at Los Angeles in 1924 (thirty-two cases with thirty deaths). The primary pneumonic plague was definitely preceded by bubonic type of rat origin. However, it is not unlikely that the rats originally contracted their plague infection from the squirrels.

Many hypotheses have been advanced to explain the pneumonic tendencies of wild rodent plague. Experimental evidence indicates that the strains of *Bacillus pestis* isolated from wild rodents possess a high virulence and a definite pneumotropism. This tendency is greatly diminished by repeated rat passages. The observations at Los Angeles confirm the recognized fact that centers of selvatic plague may give rise to epidemics of rat plague. Such transmissions have been repeatedly observed in Manchuria. It is not improbable that the epidemic in Hong Kong, which carried plague to the world, originated in the Mongolian steppe.

* From the Hooper Foundation for Medical Research of the University of California. Submitted by request.

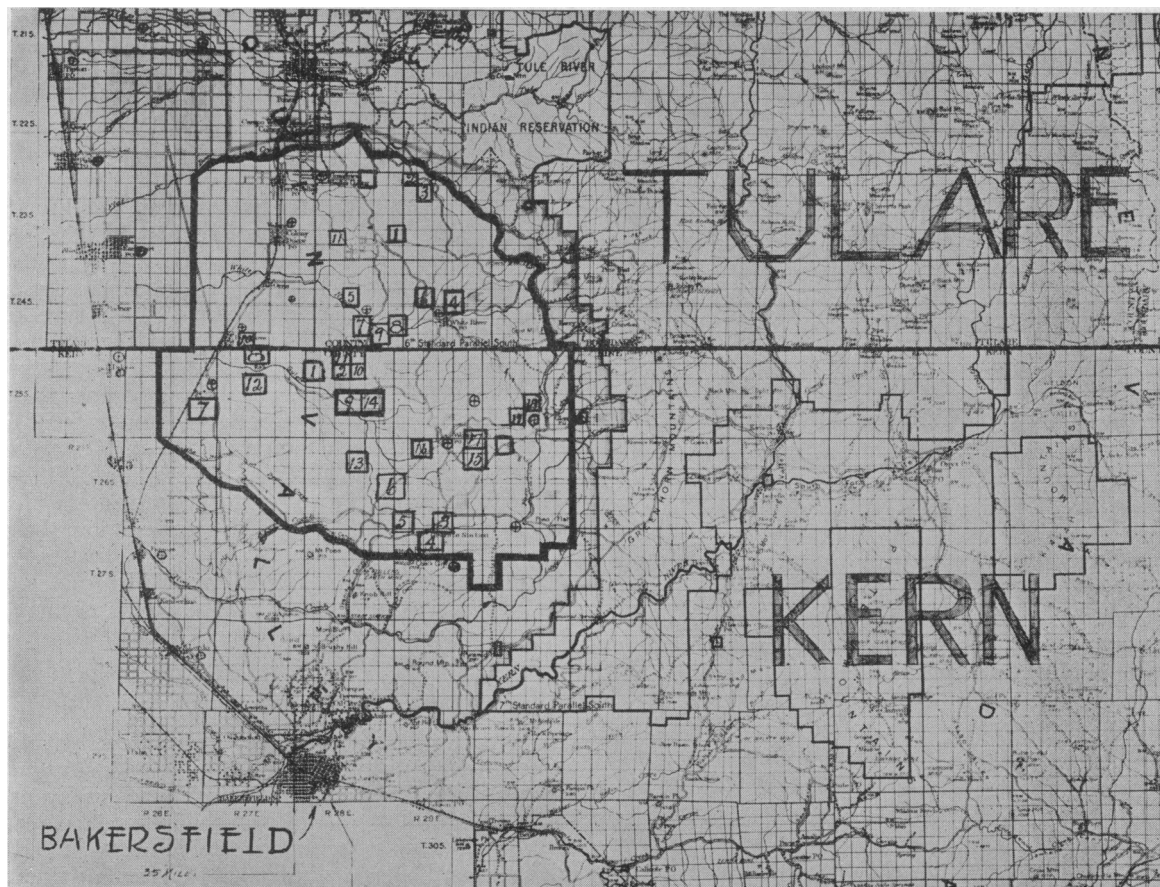


Fig. 1.—Map of district in Kern and Tulare Counties, in which squirrel plague foci have been found.

This peculiar chain of infection from wild rodent to rat and then to man has, however, reversed itself following the pandemic of 1894 and 1896. Three, possibly more, new selvatic plague areas have been established in California, in South Africa and in the Argentine. In the light of present-day knowledge it is generally agreed that plague was brought into Contra Costa County by rats on ships arriving here from some plague-infected port prior to 1900 or shortly after.

THE GROUND SQUIRREL AS A SELVATIC PLAGUE RESERVOIR

Through contact with the ground squirrel (*Citellus beecheyi*) a reservoir has been created which spreads in a manner characteristic of selvatic plague. Between 1903 and 1914 it has slowly but progressively invaded the coast counties south of the Sacramento River. Infected squirrels have been found as far south as Los Angeles County. Associated with the squirrel are other rodents, such as the brush rat (*Neotoma fuscipes*), which may serve as complementary hosts. The liability of the wild rodents to plague constitutes the main permanent reservoir of the disease which perpetrates the infection from year to year, and from century to century. While such influences as the agrarian revolution of the seventeenth century markedly reduced the malady among rats and man in western Europe, there is no assurance that under the pressure of drought and famine in the steppe regions a wholesale emigration of the wild rodents

toward the fertile human habitations may not lead to a fresh train of rat infection with all its consequences.

SQUIRREL PLAGUE IN CALIFORNIA*

These facts must be fully appreciated in a consideration of the plague situation which confronts California.

Before March, 1934, plague-infected squirrels have been demonstrated in the following counties: Contra Costa, Alameda, Los Angeles, Merced, Monterey, San Benito, San Joaquin, Santa Barbara, Santa Clara, Santa Cruz, Stanislaus, San Mateo, San Luis Obispo, and Ventura. Reports concerning an increased mortality among squirrels in the Lynn Valley near Glenville, Kern County, were received by the State Department of Public Health in the summer of 1933. During July and September, 1083 squirrels were killed by the survey crew. However, the cause of the mortality was not determined at that time. In March, 1934, the owners of ranches lying in an area of six square miles, both in Kern and Tulare counties, approximately thirty miles north and east of Bakersfield, and approximately sixteen miles east of Delano, Tulare County, noted a great many dead squirrels. An immediate survey by the plague crew supplied the Hooper Foundation and the State Bacteriological Laboratory with squirrels which revealed anatomical lesions suggestive of plague and, by

* See, also, pages 425 and 475 for other discussions of this subject.

cultural methods, a very virulent strain of *Bacillus pestis*. The rodents presented the picture of acute septicemic plague with slight involvement of the lymph nodes or viscera. Guinea-pigs infected percutaneously with the plague strains isolated from these rodents succumbed to acute septicemic plague within four to five days.

Intensive hunting surveys were promptly instituted, and by the middle of May the extent of the area which harbors plague-infected squirrels has been rather closely defined. The findings of dead or diseased squirrels are indicated on the map. The area covers, in Kern County, approximately 409 square miles or 220,160 acres, while in Tulare County 286 square miles or approximately 183,000 acres are involved. A total area under suspicion for plague covers 945 square miles in Kern and 540 square miles in Tulare County. Systematic surveys are in progress, and many districts and valleys closely adjacent to the infected zone have been or are in the process of being surveyed. Particular attention is being paid to the districts adjacent to large human habitations and summer resorts. From a technical point of view these surveys offer many difficulties, since the character of the territory involved is quite different from that previously searched for latent rodent plague. The barren hills and bottomlands are heavily infested with rattlesnakes. Hunting is tedious and time-consuming. Close to 6,000 squirrels (3,485 shot; 2,551 found dead) have been dissected and 162 have been proved by laboratory tests to be infected with *Bacillus pestis*. In Kern County ninety-four and in Tulare County sixty-eight diseased squirrels have been found. Despite the difficulties the survey crews have pushed the campaign in a relentless manner, with an admirable devotion to the task and an excellent *esprit de corps*.

TOPOGRAPHY OF THE CALIFORNIA COUNTIES INVOLVED

The topography of the country involved is typically veldt-like in character, consequently an excellent territory for an uncontrolled proliferation of rodents. The gently rolling hills, almost barren of vegetation and without any visible water, have a top adobe or lime kaolin formation dotted with bizarre masses of rocks. The latter are honeycombed with squirrel burrows. The westerly section of the area spreads into pasture lands and orchards. The eastern section of the infected area extends into higher foothill or river bottomland with sycamore and oak trees. There the burrows are not so readily discernible, but a brief visit leaves no doubt that the territory is heavily infested with young and old squirrels. Occasionally evidence in the form of dead squirrels at the opening of the burrow or fly maggots leaving the holes, together with swarms of buzzards, is seen.

Reliable reports indicate that a highly fatal disease is slowly passing through the rodent population. However, the infection has not completely eradicated the squirrels even in the most heavily infected areas. In fact, lying between two infected ranches extensive colonies of rodents may still be observed. Doubtless the young squirrels will, in the course of the present epidemic, become

victims of plague, while many of the older rodents may survive and, with a latent plague infection, retain the potential seed for the recurrence of a similar epidemic.

It is most fortunate that the area is very sparsely populated. Probably not more than seven hundred persons live in its small towns and settlements. Such former famous relay stations for traffic to mines in the national forests, as Grant's Station and White River, have only about half a dozen families living within a radius of five miles. The eleven schoolhouses located in the infected territory have received special attention and eradication measures have been promptly instituted. No human cases of plague have been reported this year.

POSSIBLE ORIGIN OF THE NEW PLAGUE TERRITORY

Concerning the origin of this new plague-infected territory, no definite conclusions have as yet been reached. Those who have surveyed the districts are fully convinced that the epidemic which wiped out the squirrel population in the vicinity of Glenville was, unquestionably, plague. But how it reached the western foothills of the Sierra Nevadas has not been determined. So far no connecting links between the old and new foci have been established. The nearest district which harbors infected squirrels is located 120 miles toward the west in San Luis Obispo County. It is rather significant that, on account of lack of funds, the wild rodent population of the infected area has, since 1930, increased at an enormous rate. In fact, complaints concerning damage done to agriculture by the squirrels is quite universal throughout both counties.

According to Elton, it is well known that the steppe rodents increase for several years and are then decimated by plague. These epidemic fluctuations obey a periodic law or give sinusoidal curves. Elton believes that there is a double periodicity of three to four years, and another of one to eleven years, the latter perhaps corresponding to climatic variations possibly related to the sun-spot cycles. When and how plague was planted in the Kern and Tulare counties remains a problem for further investigation. That it operated in the fall of 1933 is doubtless correct. The infection was continued from the fall to the spring through the fleas which prey upon the hibernating rodents. The last dry and warm winter favored a very high infestation of the rodents with insects. Incomplete data show that nearly 90 per cent of the squirrels carried not less than ten fleas. Therefore conditions favorable for the spread of plague among the rodents existed early in March and have continued during the subsequent five weeks.

Cannibalism among squirrels and in all probability buzzards, is a complementary factor in the dissemination of the disease.

PROTECTIVE MEASURES INSTITUTED BY STATE BOARD OF HEALTH

In view of these conditions the California State Department of Public Health and the State Department of Agriculture have instituted the following protective measures:

1. The ranchers and people living in the affected area have been advised of the danger inherent to the handling of dead or sick squirrels. At regular intervals prominent placards placed on fence-posts or trees extend the same warning to non-residents.

2. The health officers and physicians in the communities adjacent to the plague districts have been made acquainted with the situation and the recognition of the disease.

3. On account of lack of funds and other administrative restrictions, an active poisoning campaign with strychnin was delayed for four weeks, but is now being actively pursued in the vicinity of schoolhouses and human habitations.

4. There is no need for undue alarm. The situation is receiving proper scientific and administrative attention. Any new developments will be promptly reported.

Hooper Foundation,
Second and Parnassus Avenues.

THE PRESENT STATUS OF EPIDEMIC POLIOMYELITIS*†

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THE trend of epidemic poliomyelitis at the present time indicates that the disease is already epidemic in California, with prospects that its rise during the coming weeks will be inordinately high.

* From the California Department of Public Health.

† See, also, page 428 for other comments.

This prediction is based upon an increased incidence which occurred during the winter and early spring, followed by a sharp increase during April and May. Experience has proved that when a marked increase occurs early in the year, an intensive epidemic occurs during the summer and early fall.

FORMER EPIDEMICS IN CALIFORNIA

Three sharp epidemics of this disease have occurred in California in the past ten years—in 1925, 1927 and 1930. The 1930 outbreak was the most extensive that has ever been experienced in California. There were 1,903 cases reported during that year, with 157 deaths, a mortality rate of 8.25 per cent. In 1927, there were 1,298 reported cases, with 224 deaths, a mortality rate of 17.25 per cent. The 1927 outbreak was characterized by a higher mortality rate than in 1930, but in the 1930 epidemic half again as many cases of the disease were reported. Since January 1, 1934, 176 cases of this disease have been reported. By months they are as follows: January, 25; February, 26; March, 18; April, 36; May (first three weeks), 71.

In the 1927 outbreak, most cases (72.8 per cent) were distributed over the northern part of the state. In the 1930 outbreak half of all cases reported were in Los Angeles, although the increase in San Francisco during that year was very great, as compared with 1927. The first groups of

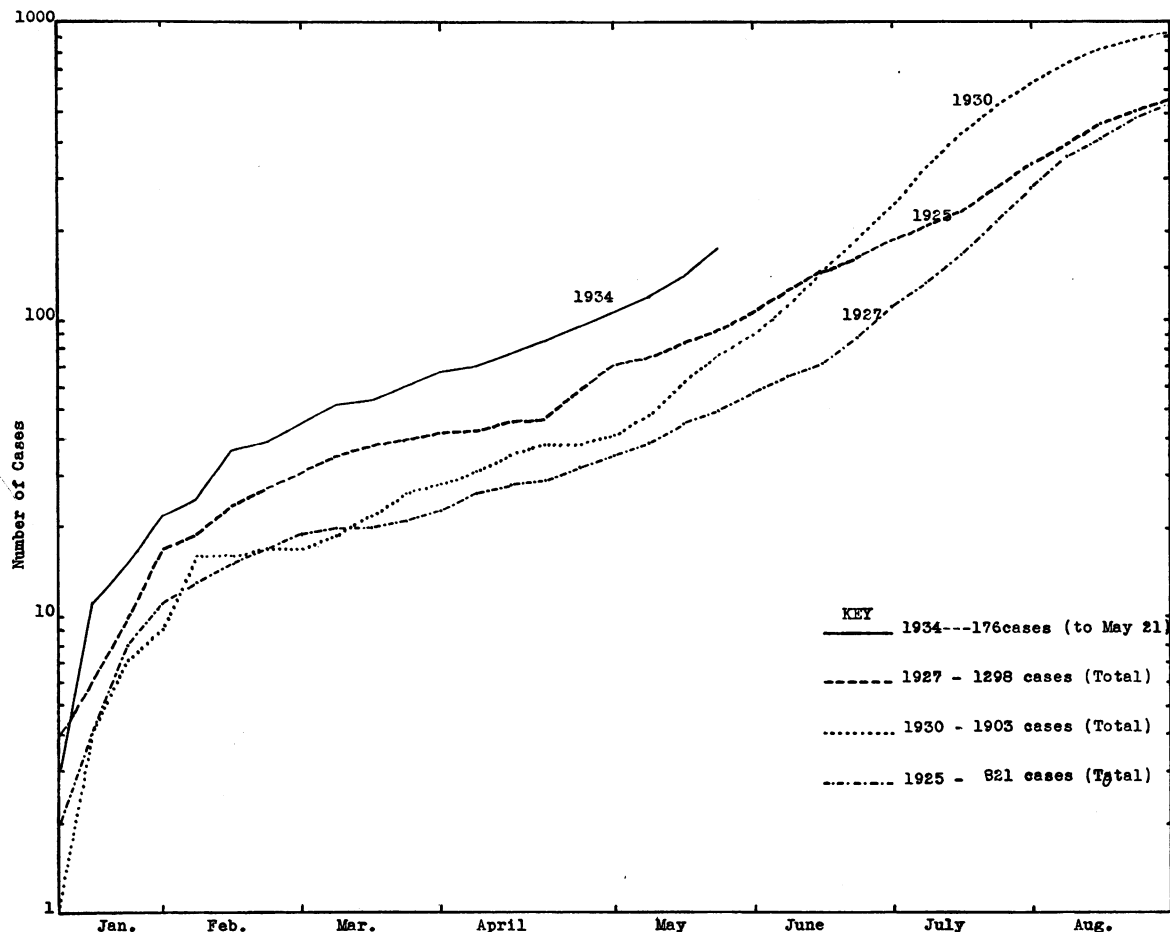


Fig. 1.—Poliomyelitis in California. Cumulative curves comparing 1934 incidence with recent epidemic years.